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INVESTIGATION OF A METHOD OF AEROSOL IMMUNIZATION AGAINST BRUCELLOSIS

by

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NOTICE

At first in laboratory conditions (1963-67) we successfully tested an aerosol method of immunizing beef cattle against brucellosis with a vaccine from strain 19; then its effectiveness was checked on two farms. Animals of all age groups were present in the latter, 267 calves 5-8 months old were selected for the tests; of these 131 were in the second department of the first farm and 136 were in the third department of the second farm. Animals in each farm were 59 calves were immunized by aerosol and in the third 63; 72 and 73 respectively were immunized subcutaneously.

Before vaccination the animals were tested for brucellosis serologically (RA, RSK) (agglutination reaction, complement-fixation reaction). Two calves with a positive and doubtful reaction were discarded. The remaining animals were given the vaccine from strain 19.

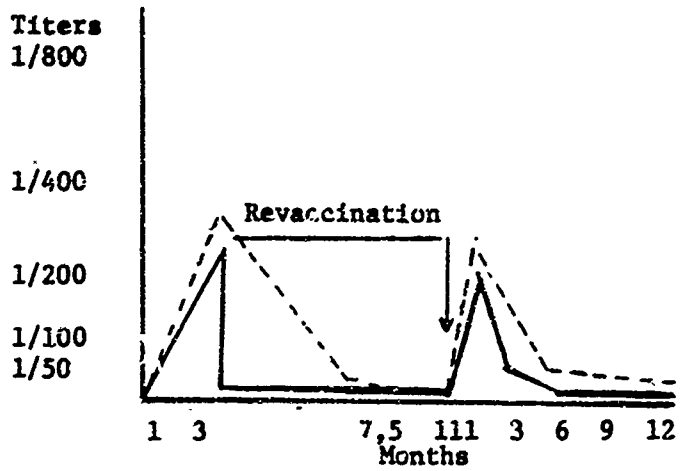
Immunization was conducted in October 1965 in a 370m^3 building. A two day culture of brucella was used for atomization. Before this it was diluted by a physiological solution to a concentration of 40 billion microbial bodies (MB) per ml. The vaccine was sprayed from two pistols, model 0-45; a model 0-30 unit was used as aerosol generator. On each farm all livestock were immunized on the assumption that one animal inhales 60 billion MB. A 100 million MB per 1 of air concentration of vaccine culture was composed for this. The cattle were exposed to immunization for one hour. In all 1,300 ml of vaccine were used, which is 3.5 ml per 1m^3. of room volume.

During and after aerosol vaccination visible deviations in the physical condition of the calves were not noticed, only a slight increase in respiration rate toward the end of the immunization was observed.

The 145 control calves were given vaccine subcutaneously with 60 billion MB apiece. All the animals immunized both by aerosol and subcutaneously were in two herds (on the second and third farms) and used the same pastures as other herds of young stock and cows in these departments.

It was noted that considerably less time was required for aerosol immunization than for subcutaneous vaccination. In the first case 100 calves were treated in 1.5 hours and in the second the same number of livestock took 2-2.5 hours.

In 1,3.5 and 7.5 months after the vaccination of the animals, blood serum was examined for presence of antibodies. Serological testing (figure) established that brucella of the vaccination strain in the aerosol, entering the organism of the calves, cause a post-vaccination reaction which is charaterized by the appearance of antibodies in the blood serum. Only in one animal were antibodies not present one month after vaccination. A similar picture was notice among animals vaccinated subcutaneously where also one animal did not react to the vaccination during this period.



Dynamics of agglutinin in blood serum of animals after aerosol and subcutaneous vaccination and revaccination. Aerosol immunization————————, subcutaneous----------.

In 3.5 months the percentage of aerosol immunized animals which were reactive abruptly decreased. High titers in RA were established in 4.2% of the animals and the other 95.8% gave negative results. 8.6% of the animals had positive RSK and 91.4% had negative. Among the group of calves immunized subcutaneously 52.3% had postive RA, 34.6% doubtful and 13% negative; in RSK 72.3% reacted positively, ie, 10 times greater. After 7.5 months, 1.5% of the animals immunized by the aerosol method reacted to RA and 17.2% (Table) reacted in the group immunized subcutaneously.

To study immunity strengbh, 11 months after vaccination all experimental animals were vaccinated a second time with the same dose and by the same methods as in the first immunization.

In the second aerosol application of vaccine three weeks after revaccination (Fig. Table)63.1% of the animals reacted to RA positively, 21.9% doubtfully and 15% negatively; to RSK-47.3%. In the group of animals vaccinated by aerosol, in 3,6 and 9 months a rapid diminution of antibodies in the blood serum was noticed-after 6 months two animals reacted positively to RA and one to RSK.

After 9 months there were no reactive animals.

In the group of calves revaccinated subcutaneously, the number of animals with positive reactions over the entire testing period was large; after 9 months 25% reacted to RA and 32.2% reacted to RSK. This data is evidence of the more lengthy retention of immuno-biological reactions after subcutaneous vaccination and revaccination in comparison with aerosol immunization and it confirms our results obtained in laboratory conditions.

In September-October 1966 the heifers were mated with bulls which were first serologically tested for brucellois. The insufficient preparation of the bulls for mating must be noted. This, in our opinion, led to sterility of the animals. Out of 260 animals, 188 calved and the others were barren or defective. Out of 122 aerosol vaccinated heifers, 87 calved normally and of 138 animals vaccinated subcutaneously, 101 calved normally. Miscarriage was noted in one case but infectious etiology was eliminated in the laboratory. Serological investigations conducted after the animals calved did not indicate increased titers. This is evidence of the well being of these groups with respect to brucellosis. 43 control animals and 9 subcutaneously vaccinated animals had miscarriages. All these animals reacted positively to brucellosis according to RA and RSK and bacteriological investigations established the etiology of the miscarriages.

Thus, aerosol immunization of beef calves by liquid vaccine from strain 19 provides sufficiently durable immunity which protects animals from contamination by brucellosis in the source of infection.

RESULTS OF SEROLOGICAL TESTING OF CALF BLOOD SERUM AFTER REVACCINATION

PERIOD OF TESTING AFTER REVACCINATION (months)	FARM #3							FARM #2						
	NUMBER OF TESTS	Method of immunization	Number of animals reacting to:					NUMBER OF BLOOD TESTS	Method of immunization	Number of animals reacting to:				
			RA			RSK				RA			RSK	
			POSITIVE	DOUBTFUL	NEGATIVE	POSITIVE	NEGATIVE			POSITIVE	DOUBTFUL	NEGATIVE	POSITIVE	NEGATIVE
3 weeks	60	Aerosol	43	9	8	31	29	54	Aerosol	29	16	9	23	31
	70	Subcutaneous	58	6	6	31	39	71	Subcutaneous	41	29	4	34	37
3 months	57	Aerosol	10	6	41	17	40	52	Aerosol	7	3	42	12	40
	68	Subcutaneous	36	17	15	31	37	61	Subcutaneous	39	14	8	43	18
6 months	61	Aerosol	2	2	57	-	61	57	Aerosol	-	1	56	1	56
	65	Subcutaneous	35	5	26	27	39	70	Subcutaneous	34	19	17	32	38
9 months	49	Aerosol	-	1	48	-	49	50	Aerosol	-	-	50	-	50
	62	Subcutaneous	19	23	20	19	43	62	Subcutaneous	12	-	50	21	41

NOTE: RA - positive in titers 1:200 and higher, negative - 1:50 - 1:100

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13. ABSTRACT

This article discusses field tests run by Soviet researchers on the possibility of using an aerosol method of immunizing against brucellosis. They used vaccine taken from strain 19. They found that their aerosol method provided sufficiently durable immunity against brucellosis for beef cattle.

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